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RECORD OF ORAL HEARING

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOSEPH S. STAM, GREGORY A. MART, KEITH H. BERENDS, GREGORY S. BUSH, JOHN K. ROBERTS, MARK W. PIERCE, JON H. BECHTEL, ERIC J. WALSTRA, and BROCK R. RYCENGA

Appeal 2008-2861
Application 10/645,801
Technology Center 2600

Oral Hearing Held: November 6, 2008

Before KENNETH W. HAIRSTON, MAHSHID D. SAADAT, and KARL D. EASTHOM, Administrative Patent Judges

ON BEHALF OF THE APPELLANTS:

JAMES SHULTZ, ESQ.
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The above-entitled matter came on for hearing on Thursday, November 6, 2008, commencing at 9:00 a.m., at The U.S. Patent and Trademark Office, 600 Dulany Street, Alexandria, Virginia, before Timothy J. Atkinson, Jr.

MS. BEAN: Calendar Number 18. Mr. Schultz.

JUDGE EASTHOM: Okay. Thank you. Spell your last name S C H U L T Z?

MR. SCHULTZ: That's correct, sir.

JUDGE HAIRSTON: Okay, thank you.

MR. SCHULTZ: Thank you.

JUDGE HAIRSTON: You may begin.

MR. SCHULTZ: We all ready?

JUDGE HAIRSTON: Yes. I'm so sorry. Go ahead. You may begin.

MR. SCHULTZ: Well, good morning officially and thanks for all your time and attention to details we're about to talk about. Maybe his -- if you would bear with me just a moment, I can just start with a description of the product so that we actually will see then what the claim set is all about.

JUDGE HAIRSTON: Okay.

MR. SCHULTZ: Actually, I recognize a couple of you from past hearings that I participated in, so I'm glad to --

JUDGE SAADAT: Okay.

MR. SCHULTZ: On both sides, thanks. Anyway, this is primarily the business that Gentex is in, is the business of rearview mirrors for vehicles, at least that was the foundation of the business. And this particular version is an automatic dimming mirror. At nighttime when you have vehicles coming behind you with bright lights on, the mirror reflectivity decreases automatically.

JUDGE HAIRSTON: Does it move or -- does the mirror move at a different angle like the old manual ones or --

MR. SCHULTZ: Actually, what is in this mirror is an electrochromic chemistry device --

JUDGE HAIRSTON: So, it's -- okay --

MR. SCHULTZ: -- two pieces of glass with a electrochromic medium sandwiched between, and a voltage is applied that darkens their light -- or darkening -- or decreasing reflectivity.

JUDGE HAIRSTON: Got you.

MR. SCHULTZ: Generally, that's how Gentex got started in the business, and with that feature it brought a lot of electronics generally into the mirror; the OnStar© communication system for example, is a part of this mirror. And one of the features that we're here today to talk about is the forward-looking camera feature, and specifically with automatic control of high-beam headlights.

We have this camera that points out the front of the vehicle and is continuing -- continuously monitoring the scene to look for headlights of oncoming cars or taillights of preceding cars, at which point you would not want your high beams on.

JUDGE HAIRSTON: All of these new mirrors are making it hard to hang my parking sticker on the mirror. Go ahead, I'm sorry.

MR. SCHULTZ: Just like in the police vehicles, too, we have a camera that has it all recorded, that actually the hardware side of it -- quite straightforward. You have a CMOS image sensor in combination with a microprocessor that automatically then interfaces with the lighting system up on the car to make all of that happen.

One of the quite complex portions of that is actually picking out the individual light sources within the scene and deciding whether they're

taillights or headlights as opposed to reflections off of signs for example, or streetlights or lights on houses, a multitude of nonvehicular light sources that we call -- that, that we're trying to classify.

JUDGE HAIRSTON: Does it do it by lumens or --

MR. SCHULTZ: Well, quite complex actually -

JUDGE HAIRSTON: Because there are so many different headlights now so that --

MR. SCHULTZ: That's, that's really one of the core teachings of this particular patent we're here to talk about, is in the earlier versions of headlight control automatic high beam, they would have a single sensor and it would have no ability to distinguish special orientation of the light sources within the same, let alone a color of them. It was just purely based on brightness of light ambient within the scene.

Over the course of time, Gentex, along with some other competitors, has actually improved on the hardware side such that it is an image sensor now that's looking out the front. So not only can you see spatially where the light sources are at, you actually can detect to some degree the color of the light sources. Thereby, you gain a lot of information as opposed to just a single sensor looking for the general ambient light level at the scene.

JUDGE HAIRSTON: Okay.

MR. SCHULTZ: So one of the areas that is critical in all of this once you have the information available, the data from the image sensor, is the algorithms that run in the microprocessor, which we will see recited in the claims quite regularly.

One option is to have a neural network, which neural networks have been around, mathematically speaking, more in the computation texts for

long, long time. Two of the references that the Examiner has relied upon for rejecting these claims, first and foremost, the Breed Patent. It incorporates a reference within a Gorman article, and the Examiner refers to the combination of Breed with that reference incorporated as teaching neural networks, or at least enabling one of ordinary skill in the art to combine that with the teachings of say, Stam, which we are very familiar with as commonly assigned patent and thereby you would come to our invention.

The Breed patent does not actually anywhere in the patent, and as we've pointed out in the Appeal Brief and any correspondence subsequent to that, teach neural networks at all.

JUDGE EASTHOM: Counsel, what about Column 20, Lines 16 to 18? I'll read it while you're looking at it. It says "Once again the key to this technology is the use of trained pattern recognition algorithms and particularly of the artificial neural network." And that's for his lighting dimming system which looks very much to me like yours. It uses a red filter. It discriminates between taillights and headlights and then it dims based on those discriminations.

MR. SCHULTZ: And that is generally true to all automatic high-beam control systems. They are attempting in some regard to distinguish light sources in the scene from those ones that you would want to dim the headlights from those in the scene that you would not want to dim. So yes, indeed, that is true, that even within Breed they are in a very bare bones context talking about sensing light sources in the scene and actually do talk about controlling the neural network or a trained pattern recognition.

The, the odd part is that it's two-fold. One is, again, they only in Breed incorporate the Gorman article by reference. They do not actually, for

example, in any of the passages even, you know, Column 20 suggest that you would have certain inputs into the neural network; for example, the position of the light source, the color of the light source, the length of time it takes to move across the scene. All those variables that you would -- that we actually teach as inputs to the neural network, there is no place within Breed that would even suggest one input into the neural network.

JUDGE EASTHOM: Well, that's -- but that's -- there's nothing like that claimed in Claim 1, is there?

MR. SCHULTZ: Well, actually, I just want to start with describing how void Breed is of any actual teaching of the use of a neural network to control a headlight.

JUDGE EASTHOM: Well, we just established that it does teach that, I thought.

MR. SCHULTZ: Well, actually, I'm pointing to the fact that it only mentions it in passing, and it only teaches it to the, to the constraint that they incorporate Gorman. Gorman is not an article at all about neural networks.

JUDGE EASTHOM: Wait, wait. I, I don't understand what your argument is that it's in the context of Gorman and I think it's in the context of neural networks in general, and you've just told me that neural networks are old in art.

MR. SCHULTZ: That's, that's true. Let, let me --

JUDGE EASTHOM: Okay.

MR. SCHULTZ: -- maybe -- if, if you would like I can jump to one of the claims; for example -- and I can point --

JUDGE EASTHOM: You are only arguing about Claim 1 from your Brief?

MR. SCHULTZ: Well, we can certainly start with Claim 1 and many other arguments around. Take, for example, Claim 1. You get clear to the -- Claim 1 -- it actually does not rely upon the, the neural network. It, it doesn't actually cite that at all -- recite that at all.

JUDGE EASTHOM: Right. It just says classification network.

MR. SCHULTZ: Right.

JUDGE EASTHOM: Trains --

MR. SCHULTZ: Totally different than a neural network.

JUDGE EASTHOM: Expert knowledge, I thought, was in your spec related to neural networks.

MR. SCHULTZ: Well, expert knowledge is like empirical data. Expert knowledge is like when you would drive the vehicle with our system in it you would actually identify where it had missed -- malperformed, for example. That's expert knowledge as we've defined it in our specification.

JUDGE EASTHOM: Well, don't you train the network using that expert knowledge? That's what your claim says, trained using light sources, classified using expert knowledge.

MR. SCHULTZ: That's correct. Expert knowledge is the person --

JUDGE EASTHOM: Well, that's training. Isn't that a neural network? I, I mean if you're gong to say your claim doesn't require neural network, I don't understand why we're arguing then Gorman doesn't teach neural networks.

MR. SCHULTZ: Well, in the context of Claim 1 it only actually applies tangentially at best. There's another claim that we actually recite neural network per se, Claim 4 for example.

JUDGE EASTHOM: Maybe we should just start with what is missing in Claim 1 from the Breed reference. Maybe we could just simplify.

MR. SCHULTZ: Well, actually, in, in Claim 1 with -- without doubt, very simplistically speaking, we recite explicitly a first algorithm and a second algorithm. No place in any of the references there are two algorithms described, and it's a quite important distinction that the Examiner did not grasp a hold of.

JUDGE EASTHOM: Counsel, did you argue that in your Brief on, on --

MR. SCHULTZ: Yes, certainly did. On Page 19, you know, for certain in that that's the reference that the Examiner relies upon for rejecting that particular claim.

In all the contexts on Page 19, what the Examiner does point out is -- relies on neural networks and that's what I guess I'm trying to say, is that in Claim 1 that is only tangentially related at best. There -- the Examiner hadn't even pointed to or alleged that Breed teaches a first and a second algorithm.

JUDGE EASTHOM: I don't see you arguing that in your Brief there.

MR. SCHULTZ: Actually, the last paragraph is --

JUDGE EASTHOM: Well, you repeated the claim for sure.

MR. SCHULTZ: Certainly that is the, the primary purpose as the Examiner rejected upon -- based upon Breed. So I'm trying to describe in a general context why Breed itself does not even apply because it does not teach any detail whatsoever about any of the claim language in Claim 1 because neural networks aren't even recited in Claim 1. So really the Breed reference is not even applicable whatsoever to Claim 1; however, that was the Examiner's rejection so we have to address it.

JUDGE EASTHOM: Okay.

JUDGE SAADAT: In the sense of the two algorithms, what is the function of the first algorithm in your claim?

MR. SCHULTZ: Well, as -- the --

JUDGE SAADAT: That Breed doesn't --

MR. SCHULTZ: As described in -- throughout the specification, we actually have a series of four algorithms that work in concert with one another, and in Claim 1 we're only reciting the first and the second one because, for example, the first one would be classifying the light sources in the scene. The second algorithm would then maybe actually do something with the headlights. For example, if the classification algorithm ran the algorithm and described -- and came to the conclusion that there were three light sources in the scene, one of them at certain position and another one that was at another and classified them --

JUDGE SAADAT: That's the disclosed function, but in the claim --

MR. SCHULTZ: That's the first algorithm.

JUDGE SAADAT: -- you require, you require a first algorithm which again is only required in the claim to include or comprise at least a second algorithm, so -- and then --

MR. SCHULTZ: That's correct.

JUDGE SAADAT: -- the second algorithm would have certain functions that are listed in the claim.

MR. SCHULTZ: And, and that's what I'm saying, is that there isn't any of the references that have that -- it's just purely jumping to the decision state. They do not have two algorithms that they describe anywhere in Breed or any of the other references for that matter.

JUDGE EASTHOM: Well, it says there's trained pattern algorithms; that's a plural.

MR. SCHULTZ: What would the second one be?

JUDGE EASTHOM: One of the two, one of the two, plural.

MR. SCHULTZ: And, and then there's further limitations. Actually, as recited in the claim, we have the fact that we have a first algorithm comprising at least the second algorithm and then the, you know, second algorithm is selected from a specific group of things that further aren't taught in Breed at all. I guess that's what I'm saying. Just generally speaking, yes, that is true. Breed talks about the general concept of trained pattern recognition and neural networks; however, it never mentions that an on-state to off-state transition state algorithm.

JUDGE EASTHOM: Well, it does because it, it dims the light.

MR. SCHULTZ: Well, playing our, you know, our own lexicographer to an extent that the transition state algorithm is a truly hyper defined term. We'll find in another claim we talk about we recite that the output of the neural network is three or more states. One of those states is a transition state. It's not the off-state or the on-state. It's a third state and that is another fundamental misunderstanding I think in the overall rejection.

Just like as in Claim 1, we're talking about specific things that we have found to be advantageous and none of the references have actually recognized the shortcoming let alone offered solutions. And in this claim truly the second algorithm selected from an on-state off-state transition that's not been Breed. And then an on -- an off-state to an on-state transition. That's not in Breed; either one.

JUDGE EASTHOM: You only need one of those in your claim.

MR. SCHULTZ: That's why I'm saying neither one of them is in there.

JUDGE EASTHOM: Why, why isn't dimming something an on to an off or an off to an on?

MR. SCHULTZ: That's, that's what I'm saying. In Breed it only teaches going off to on or on to off. In our claim we're reciting --

JUDGE EASTHOM: Why isn't that -- I don't understand why that's not an on-state transition, or an off-state transition.

MR. SCHULTZ: As in our claim -- in, in our specification we actually define that to mean that there are other things happening during that transition period. Actually assuring -- it's all based upon probabilities and the fact that all of our claims talk about either three states or in this context an off state transition state. Truly the state of the headlights do not, do not change at all during that transition state. It's only moving closer -- say if they're on --

JUDGE EASTHOM: Well, they don't turn off instantaneously, right?

MR. SCHULTZ: Well, what I'm saying is in our specification --

JUDGE EASTHOM: No, in Breed they don't turn off instantaneously. I mean the energy has to dissipate.

MR. SCHULTZ: Well, there is no transition state, though.

JUDGE EASTHOM: The, the, the light --

MR. SCHULTZ: Purposeful transition state.

JUDGE EASTHOM: The light --

MR. SCHULTZ: When the algorithm gets to the point it's decided to move it from on to off or off to on; it is -- there is no transition state that would look further frames to see if the decisions that were going to be

imposed actually want to. Here's one example that we teach in our specification; say that you're actually coming down the road and you, you have in one analysis of an image you've decided that it's like fifty percent probable that one of the light sources is a headlight. You do not want to dim your own high-beams at that point because it's only fifty percent probable that one light source.

So what we teach is actually analyzing another image during a transition state that you would further refine the decision from fifty percent probability you might either come that it's less likely or more likely. So you're transitioning inching closer toward turning them off if they're on or on if they're off, but you're not actually doing either; turning them off -- turning them on. You're truly in a transition state, and that is indeed the part that's missing in Breed or any of the other references; even our own as we would actually make the decision turn from on to off or off to on whereas with this improvement the period of time you actually have like hysteresis, if you know what I mean.

JUDGE EASTHOM: I know what hysteresis is.

MR. SCHULTZ: They might turn on when something is real dark and they won't immediately turn back on or off if it -- you pass a street light. You have to, you know, fairly big gap, so same thing here; on state, transition state, off state transition states are different in and of themselves. So that would be Claim 1. Definitely none of that is taught in Breed at all.

JUDGE SAADAT: So you're suggesting that dimming recognition in Breed is different from on state to off state transition state --

MR. SCHULTZ: I'm suggesting even in Breed, they'll either turn off if they're on or they'll turn on if they're off. They don't have -- they do not

teach a transition state where you're truly as in a histeresis loop or a, you know, just an assurance an averaging type of a phenomenon.

JUDGE EASTHOM: Let me ask you this: In other words, you're saying that on state to off state transition state algorithm means you're making a decision?

MR. SCHULTZ: It, it means just like the example I gave, you're not actually changing the state of the -- your own headlights.

JUDGE EASTHOM: Oh, you're just -- you're deciding whether you're going to.

MR. SCHULTZ: It's a transition state truly.

JUDGE EASTHOM: Doesn't Breed have to decide whether or not to do it depending on what it is?

MR. SCHULTZ: That's what I'm saying. They do not truly have what we define as a transition state. They do not verify. They do not even teach a probability. They don't teach more than two states. It's either on or it's off, period. Many of our other claims as we'll get to --

JUDGE EASTHOM: Well, I don't think you're arguing that you're going to go from off to on. You're saying you're making a decision whether to from off to on. That's your transition.

MR. SCHULTZ: We're actually verifying over a long period of time a transition state, truly. What we define as a transition state we're actually rechecking the decision that would have automatically happened depending on a, as we recite in the claims, a multitude of different variables.

JUDGE EASTHOM: Well, what about, you know, Breed says he wants to distinguish between signs? So isn't he making a decision there whether or not to dim?

MR. SCHULTZ: True, but he doesn't actually describe a transition state where he'll actually analyze one frame and it has 50 percent probability, for example. He'll analyze another frame before he actually has something happen.

JUDGE EASTHOM: Right, but he'll, he'll determine whether or not there's a reflection or it's a headlight, correct?

MR. SCHULTZ: And that would be something other than a transition state that we're claiming.

JUDGE EASTHOM: That's your argument? Okay.

MR. SCHULTZ: That we're claiming here, exactly right. Yeah, it is, it is interesting that you can read this and overlook the transition state, and we truly -- in other claims we'll, we'll see that we have --

JUDGE EASTHOM: Well, I have to be honest; I don't see the distinction between transition states where you decide whether it's a sign and a light or whether you assign a probability because a probability isn't in your claim. In other words, you're going to have to make a decision and it's going to take time.

MR. SCHULTZ: Well, first -- the first claim does not have probability in it. We rely on the fact that we're reciting an on state -- let me say this first -- off state transition state algorithm or an off state to on state transition algorithm. Those are the two things that are missing here in Breed. They, they do not actually -- so that's just with Claim 1.

Claim 40 is the next one under that particular rejection just on Breed. That is highly focused specifically on the, the on state to off state transition algorithm or the off state to on state transition algorithm. Those are truly the only limitations in Claim 40.

Claim 44 -- here is comes in the language which of the wherein set out comprises at least three states. That is again it can either be an on state. This is explicitly described in the specification; point to it elsewhere. It can be either an on state, one of the two transition states either on to off state transition state or off to on whichever, and then the off. So you really -- we describe several more states, but at least three is what we're saying here to distinguish Breed and others that simply have an on or off. That's the meaning about having an output comprises it at least three states.

JUDGE EASTHOM: Claim 44?

MR. SCHULTZ: That's correct. So what's interesting with those three claims you see the first two ferrets out the fact that we have those transition states that we rely upon elsewhere to reflect additional states beyond on and off.

Claim 47 -- that this is more the empirical data that wherein the classification network determines the type of light source detected based upon at least one characteristic of at least one previously classified light source. That's even a further refinement of the transition state. That's one of the things that goes on. As I described a moment ago, we're not just looking at one image and deciding whether to turn on or off. We're actually having a transition state where we're looking at more than one frame. So that's brought out a little more direct in Claim 47 for example.

Claim 50 -- the expert knowledge again that comes in from the fact that when we drive as we've described in the specification, one of the main factors here respective of what type of algorithm you use you want to know when the system acted inappropriately. So we do test drives in the evening and we actually have the expert knowledge that we know when the system

malfunctions, so then we can go back and attempt to identify why did it misclassify a light source or were there two light sources and it confused one of the two. Expert knowledge is what we mean in this claim, that we actually fine tune the algorithm via that empirical data that we've -- that would be Claim 50.

Still highly focused on the transition state, these claims actually talk about, you know, what goes on during that period of time. In Claim 65, you go more to the heart of the neural network and we're talking about it comprising at least one waiting factor and that's established by statistical data. That seems to me what the Examiner is thinking that the Gorman reference teaches; that level of detail of a neural network. The Gorman reference again, as I was asserting a moment ago why I really like to focus on it is it truly never talks about waiting factors or any of the inputs that you would put into a neural network or whether you'd have one output state or three. Never once does Gorman even let alone Breed talk about that aspect of a neural network.

So for example, 65, the fact that we recite at least one waiting factor there are none of the references that teach using a neural network with any waiting factors let alone one. You know, just completely missing in the reference.

Sixty-nine -- he substantially continuous output value indicative of a probability. That again is a major oversight in either Breed or for that matter, the secondary reference Lee et al. Neither of them actually discuss having an output of a neural network that is a continuum. It's either a Boolean one or a zero is the outcome typically and what we have found is that it is most advantageous the way we use it to line up with a continuum so

that any one light source would have a probability between zero and a hundred of actually being one type or the other. It won't actually say it is or it isn't. It just -- and that again goes back to the transition state. All our competition they're either making a yes or a no decision. We've actually designed in our system a continuum probability such that the end result is more reliable.

So, you know, Claim 69 again it has the substantially continuous output that's completely missing. Claim 71 has the -- again the neural network -- the classification network with the statistical data weighting factor; again not in the prior art at all. So, you know, that's, that's the biggest picture that seems to be the Examiner on one context he was relying on two references; Breed with the incorporation of Gorman and Lee as teaching truly neural networks and all the things that would enable one of ordinary skill in the art to arrive at our invention.

And when in actuality neither Breed with Gorman included nor Lee teach neural networks per se. They're actually articles about some use of a neural network in themselves. They're not truly teaching neural networks.

JUDGE EASTHOM: Well, Breed, Breed teaches a neural network. I thought we --

MR. SCHULTZ: Well, again, just in passing says it could be used but again the detail then that we recite in our claims it does -- Breed nor Gorman, either one, have those individual elements that we recited in our claims.

JUDGE HAIRSTON: Counsel, counsel, I think we have the issue. We've far exceeded your 20 minutes. Can we get you to sum up in one minute?

MR. SCHULTZ: I can certainly sum up. And actually, that is a good summary because the, the bottom line is between that on the reference side the references just purely do not have what our claims recite. Second to that, the Examiner seemed to not be able to find certain language; Claim 41 for example, a Dependent Claim explicitly recites language that is within the specification and we point to the exact place. The words verbatim are there and the Examiner has stuck with the 1.75 rejection for example. And, and after interviewing the case and we actually looked at the paragraphs that that language is within, those, those are out there. So it seems to indicate to me there is some confusion still on the Examiner's understanding of the invention. So both on the references and our own disclosure, hopefully you will review on the merits and --

JUDGE HAIRSTON: Okay.

MR. SCHULTZ: -- move forward.

JUDGE EASTHOM: Thank you, counsel. Thank you.

MR. SCHULTZ: You have any questions or -- thank you very much.

JUDGE HAIRSTON: Thank you.

(Whereupon, the hearing concluded at 10:45 a.m. on November 6, 2008.)